Miller
The Power of Blue.

OM-189 112 January 1998
Eff. w/Serial Number ME144734

Processes

TIG (GTAW) Welding

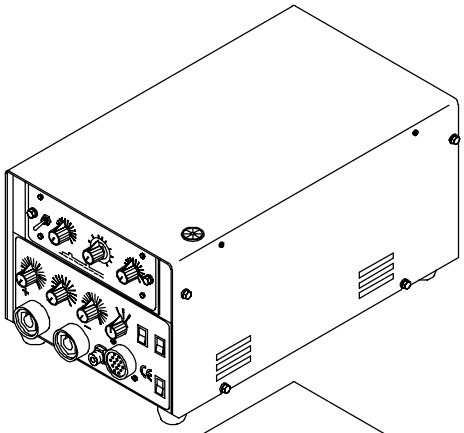
Stick (SMAW) Welding

Description

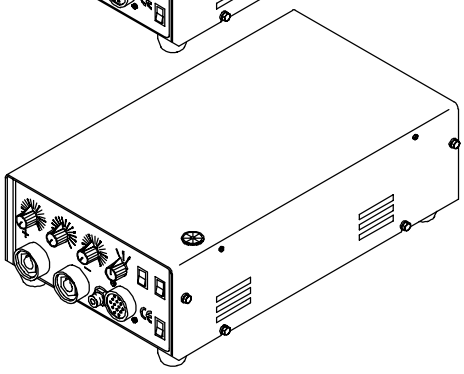
1 Phase

CE

Soft Start



2-2F



1

OWNER'S MANUAL

Visit our website at
www.MillerWelds.com

From Miller to You

Thank you and *congratulations* on choosing Miller. Now you can get the job done and get it done right. We know you don't have time to do it any other way.

That's why when Niels Miller first started building arc welders in 1929, he made sure his products offered long-lasting value and superior quality. Like you, his customers couldn't afford anything less. Miller products had to be more than the best they could be. They had to be the best you could buy.

Today, the people that build and sell Miller products continue the tradition. They're just as committed to providing equipment and service that meets the high standards of quality and value established in 1929.

This Owner's Manual is designed to help you get the most out of your Miller products. Please take time to read the Safety precautions. They will help you protect yourself against potential hazards on the worksite. We've made installation and operation quick and easy. With Miller you can count on years of reliable service with proper maintenance. And if for some reason the unit needs repair, there's a Troubleshooting section that will help you figure out what the problem is. The parts list will then help you to decide which exact part you may need to fix the problem. Warranty and service information for your particular model are also provided.

TRUE BLUE® WARRANTY

Working as hard as you do – every power source from Miller is backed by the most hassle-free warranty in the business.

Miller Electric manufactures a full line of welders and welding related equipment. For information on other quality Miller products, contact your local Miller distributor to receive the latest full line catalog or individual catalog sheets.

Miller®
The Power of Blue.

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WARRANTY

Declaration of Conformity
“CE” Dichiarazione di Conformità

Manufactruer’s Name:
Nome del Costruttore:
MILLER Europe S.p.A.

Manufacturer’s Address:
Indirizzo Costruttore:
Via Privata Iseo, 6/E
20098 San Giuliano
Milanese, Italy

Declares that this product:
Dichiara che il Prodotto:
Soft Start 1, 2 and 2F

Conforms to the following Directives and Standards:
È Conforme alle seguenti Direttive e Norme.

Direttive

Electromagnetic Compatibility Directives: 89/336/EEC, 92/31/EEC
Compatibilità Elettromagnetica: (EMC) 89/336/CEE, 92/31/CEE

Low Voltage: 73/23/EEC
Direttiva bassa tensione: 73/23/CEE

Machinery Directives: 89/392/EEC
Direttiva Macchine: 89/392/CEE

And their amendments 91/368/EEC, 93/C 133/04, 93/68/EEC
Aggiornate dalle direttive 91/368/CEE, 93/C 133/04, 93/68/CEE

Norme

Safety Requirements for Arc Welding Equipment part 1: EN 60974-1, 1990
Prescrizioni di sicurezza per apparecchi di saldatura ad arco, Sezione 1: EN 60974-1, 1990

Arc Welding Equipment Part 1: Welding Power Sources: IEC 974-1 (April 1995 - Draft revision)
Apparecchi di saldatura ad arco, Sezione 1: Alimentatori per saldatura: IEC 974-1
(Aprile 1995 - Revisione preliminare)

Degrees of Protection provided by Enclosures (IP code): IEC 529: 1989
Grado di protezione fornito dagli involucri (codice IP): IEC 529: 1989

Insulation coordination for equipment within low-voltage systems:
Part 1: Principles, requirements and tests: IEC 664-1: 1992
Coordinazione dell’isolamento per apparecchi di sistemi a bassa tensione,
Sezione 1 – Principi, requisiti e prove: IEC 664-1: 1992

Electromagnetic compatibility (EMC) Product standard for arc welding equipment:
EN50199: August 1995
Norma sulla compatibilità elettromagnetica (EMC) dei prodotti per apparecchi di saldatura ad arco:
EN50199, agosto 1995

European Contact:
In Europa Contattare:
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MILLER Europe S.P.A.
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Milanese, Italy

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Fax: 39(0)2-98281-552

SECTION 1 – SAFETY PRECAUTIONS - READ BEFORE USING

som _nd_4/98

1-1. Symbol Usage

Means Warning! Watch Out! There are possible hazards with this procedure! The possible hazards are shown in the adjoining symbols.

▲ **Marks a special safety message.**

☞ *Means "Note"; not safety related.*

This group of symbols means Warning! Watch Out! possible ELECTRIC SHOCK, MOVING PARTS, and HOT PARTS hazards. Consult symbols and related instructions below for necessary actions to avoid the hazards.

1-2. Arc Welding Hazards

▲ **The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard. The safety information given below is only a summary of the more complete safety information found in the Safety Standards listed in Section 1-4. Read and follow all Safety Standards.**

▲ **Only qualified persons should install, operate, maintain, and repair this unit.**

▲ **During operation, keep everybody, especially children, away.**

ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

- Do not touch live electrical parts.
- Wear dry, hole-free insulating gloves and body protection.
- Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground.
- Do not use AC output in damp areas, if movement is confined, or if there is a danger of falling.
- Use AC output ONLY if required for the welding process.
- If AC output is required, use remote output control if present on unit.
- Disconnect input power or stop engine before installing or servicing this equipment. Lockout/tagout input power according to OSHA 29 CFR 1910.147 (see Safety Standards).
- Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.
- Always verify the supply ground – check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet.
- When making input connections, attach proper grounding conductor first – double-check connections.
- Frequently inspect input power cord for damage or bare wiring – replace cord immediately if damaged – bare wiring can kill.
- Turn off all equipment when not in use.
- Do not use worn, damaged, undersized, or poorly spliced cables.
- Do not drape cables over your body.
- If earth grounding of the workpiece is required, ground it directly with a separate cable.
- Do not touch electrode if you are in contact with the work, ground, or another electrode from a different machine.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Wear a safety harness if working above floor level.
- Keep all panels and covers securely in place.
- Clamp work cable with good metal-to-metal contact to workpiece or worktable as near the weld as practical.
- Insulate work clamp when not connected to workpiece to prevent contact with any metal object.
- Do not connect more than one electrode or work cable to any single weld output terminal.

SIGNIFICANT DC VOLTAGE exists after removal of input power on inverters.

- Turn Off inverter, disconnect input power, and discharge input capacitors according to instructions in Maintenance Section before touching any parts.

FUMES AND GASES can be hazardous.

Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

- Keep your head out of the fumes. Do not breathe the fumes.
- If inside, ventilate the area and/or use exhaust at the arc to remove welding fumes and gases.
- If ventilation is poor, use an approved air-supplied respirator.
- Read the Material Safety Data Sheets (MSDSs) and the manufacturer's instructions for metals, consumables, coatings, cleaners, and degreasers.
- Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Always have a trained watch-person nearby. Welding fumes and gases can displace air and lower the oxygen level causing injury or death. Be sure the breathing air is safe.
- Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
- Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and if necessary, while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.

ARC RAYS can burn eyes and skin.

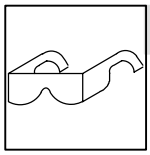
Arc rays from the welding process produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin. Sparks fly off from the weld.

- Wear a welding helmet fitted with a proper shade of filter to protect your face and eyes when welding or watching (see ANSI Z49.1 and Z87.1 listed in Safety Standards).
- Wear approved safety glasses with side shields under your helmet.
- Use protective screens or barriers to protect others from flash and glare; warn others not to watch the arc.
- Wear protective clothing made from durable, flame-resistant material (leather and wool) and foot protection.

WELDING can cause fire or explosion.

Welding on closed containers, such as tanks, drums, or pipes, can cause them to blow up. Sparks can fly off from the welding arc. The flying sparks, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode to metal objects can cause sparks, explosion, overheating, or fire. Check and be sure the area is safe before doing any welding.

- Protect yourself and others from flying sparks and hot metal.
- Do not weld where flying sparks can strike flammable material.
- Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
- Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
- Watch for fire, and keep a fire extinguisher nearby.
- Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
- Do not weld on closed containers such as tanks, drums, or pipes, unless they are properly prepared according to AWS F4.1 (see Safety Standards).
- Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock and fire hazards.
- Do not use welder to thaw frozen pipes.
- Remove stick electrode from holder or cut off welding wire at contact tip when not in use.
- Wear oil-free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.
- Remove any combustibles, such as a butane lighter or matches, from your person before doing any welding.



FLYING METAL can injure eyes.

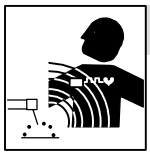
- Welding, chipping, wire brushing, and grinding cause sparks and flying metal. As welds cool, they can throw off slag.
- Wear approved safety glasses with side shields even under your welding helmet.

BUILDUP OF GAS can injure or kill.

- Shut off shielding gas supply when not in use.
- Always ventilate confined spaces or use approved air-supplied respirator.

HOT PARTS can cause severe burns.

- Do not touch hot parts bare handed.
- Allow cooling period before working on gun or torch.



MAGNETIC FIELDS can affect pacemakers.

- Pacemaker wearers keep away.
- Wearers should consult their doctor before going near arc welding, gouging, or spot welding operations.

NOISE can damage hearing.

Noise from some processes or equipment can damage hearing.

- Wear approved ear protection if noise level is high.

CYLINDERS can explode if damaged.

Shielding gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process, be sure to treat them carefully.

- Protect compressed gas cylinders from excessive heat, mechanical shocks, slag, open flames, sparks, and arcs.
- Install cylinders in an upright position by securing to a stationary support or cylinder rack to prevent falling or tipping.
- Keep cylinders away from any welding or other electrical circuits.
- Never drape a welding torch over a gas cylinder.
- Never allow a welding electrode to touch any cylinder.
- Never weld on a pressurized cylinder – explosion will result.
- Use only correct shielding gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.
- Turn face away from valve outlet when opening cylinder valve.
- Keep protective cap in place over valve except when cylinder is in use or connected for use.
- Read and follow instructions on compressed gas cylinders, associated equipment, and CGA publication P-1 listed in Safety Standards.

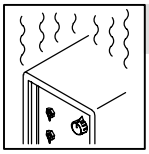
1-3. Additional Symbols For Installation, Operation, And Maintenance

FIRE OR EXPLOSION hazard.

- Do not install or place unit on, over, or near combustible surfaces.
- Do not install unit near flammables.
- Do not overload building wiring – be sure power supply system is properly sized, rated, and protected to handle this unit.

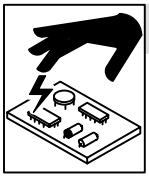
FALLING UNIT can cause injury.

- Use lifting eye to lift unit only, NOT running gear, gas cylinders, or any other accessories.
- Use equipment of adequate capacity to lift and support unit.
- If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.



OVERUSE can cause OVERHEATING

- Allow cooling period; follow rated duty cycle.
- Reduce current or reduce duty cycle before starting to weld again.
- Do not block or filter airflow to unit.



STATIC (ESD) can damage PC boards.

- Put on grounded wrist strap BEFORE handling boards or parts.
- Use proper static-proof bags and boxes to store, move, or ship PC boards.

MOVING PARTS can cause injury.

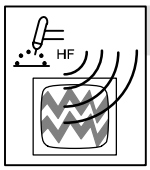
- Keep away from moving parts.
- Keep away from pinch points such as drive rolls.

WELDING WIRE can cause injury.

- Do not press gun trigger until instructed to do so.
- Do not point gun toward any part of the body, other people, or any metal when threading welding wire.

MOVING PARTS can cause injury.

- Keep away from moving parts such as fans.
- Keep all doors, panels, covers, and guards closed and securely in place.



H.F. RADIATION can cause interference.

- High-frequency (H.F.) can interfere with radio navigation, safety services, computers, and communications equipment.
- Have only qualified persons familiar with electronic equipment perform this installation.
- The user is responsible for having a qualified electrician promptly correct any interference problem resulting from the installation.
- If notified by the FCC about interference, stop using the equipment at once.
- Have the installation regularly checked and maintained.
- Keep high-frequency source doors and panels tightly shut, keep spark gaps at correct setting, and use grounding and shielding to minimize the possibility of interference.

ARC WELDING can cause interference.

- Electromagnetic energy can interfere with sensitive electronic equipment such as computers and computer-driven equipment such as robots.
- Be sure all equipment in the welding area is electromagnetically compatible.
- To reduce possible interference, keep weld cables as short as possible, close together, and down low, such as on the floor.
- Locate welding operation 100 meters from any sensitive electronic equipment.
- Be sure this welding machine is installed and grounded according to this manual.
- If interference still occurs, the user must take extra measures such as moving the welding machine, using shielded cables, using line filters, or shielding the work area.

1-4. Principal Safety Standards

Safety in Welding and Cutting, ANSI Standard Z49.1, from American Welding Society, 550 N.W. LeJeune Rd, Miami FL 33126

Safety and Health Standards, OSHA 29 CFR 1910, from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers That Have Held Hazardous Substances, American Welding Society Standard AWS F4.1, from American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202.

Code for Safety in Welding and Cutting, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.

Safe Practices For Occupation And Educational Eye And Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 1430 Broadway, New York, NY 10018.

Cutting And Welding Processes, NFPA Standard 51B, from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

1-5. EMF Information

Considerations About Welding And The Effects Of Low Frequency Electric And Magnetic Fields

Welding current, as it flows through welding cables, will cause electromagnetic fields. There has been and still is some concern about such fields. However, after examining more than 500 studies spanning 17 years of research, a special blue ribbon committee of the National Research Council concluded that: “The body of evidence, in the committee’s judgment, has not demonstrated that exposure to power-frequency electric and magnetic fields is a human-health hazard.” However, studies are still going forth and evidence continues to be examined. Until the final conclusions of the research are reached, you may wish to minimize your exposure to electromagnetic fields when welding or cutting.

To reduce magnetic fields in the workplace, use the following procedures:

1. Keep cables close together by twisting or taping them.
2. Arrange cables to one side and away from the operator.
3. Do not coil or drape cables around your body.
4. Keep welding power source and cables as far away from operator as practical.
5. Connect work clamp to workpiece as close to the weld as possible.

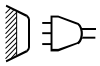
About Pacemakers:

Pacemaker wearers consult your doctor first. If cleared by your doctor, then following the above procedures is recommended.

SECTION 2 – DEFINITIONS

2-1. Symbols and Definitions

Note ☞ *Some symbols are found only on CE products.*

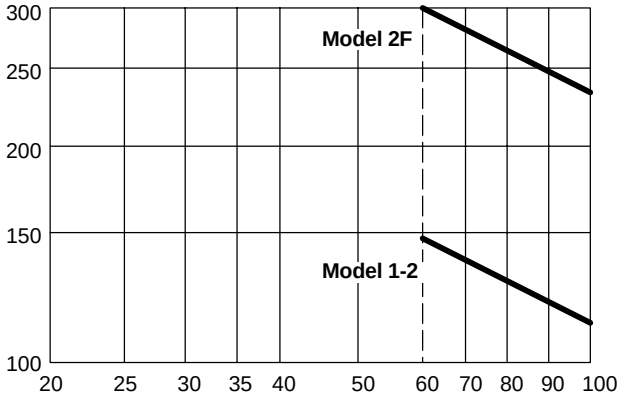
A	Amperes		Amperage Control/ Panel		Gas Tungsten Arc Welding (GTAW)		Shielded Metal Arc Welding (SMAW)
	Temperature		Do Not Switch While Welding		Arc Force (DIG)	%	Percent
	Output		Circuit Breaker		Remote	V	Volts
	Protective Earth (Ground)	+	Positive	—	Negative		Input
I	On	O	Off	Hz	Hertz		Direct Current
U_0	Rated No Load Voltage (Average)	U_1	Primary Voltage	U_2	Conventional Load Voltage		Line Connection
I_1	Primary Current	I_2	Rated Welding Current	X	Duty Cycle		Three-Phase Transformer Rectifier
IP	Degree Of Protection	3~	Three-Phase	S_1	KVA		Work Connection
	Wire Feeder		Electrode Connection				

SECTION 3 – INSTALLATION

3-1. Specifications

Model	Drawing Number	Code		Rated output at 60% DC	Dimensions (mm)			Weight (kg)
		115 V	220 V		Height	Width	Depth	
1	OP	029012009	029012010	150 Amp	132	241	419	14
2	OM	029012011	029012012	150 Amp	212	241	419	15
2F	PM	029012013	029012014	300 Amp	212	241	419	17

3-2. Duty Cycle and Overheating

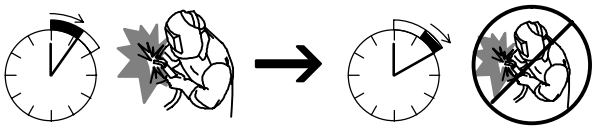


Duty Cycle is percentage of 10 minutes that unit can weld at rated load without overheating.

If unit overheats, thermostat(s) opens, output stops, and cooling fan runs. Wait fifteen minutes for unit to cool. Reduce amperage or duty cycle before welding.

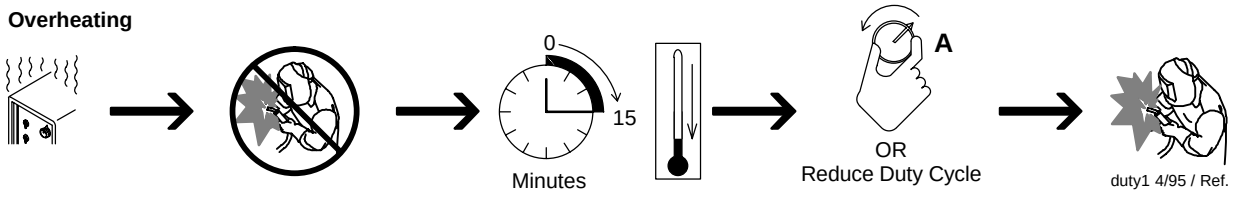
▲ **Exceeding duty cycle can damage unit and void warranty.**

Example: 60% Duty Cycle =



6 Minutes Welding 4 Minutes Resting

Overheating

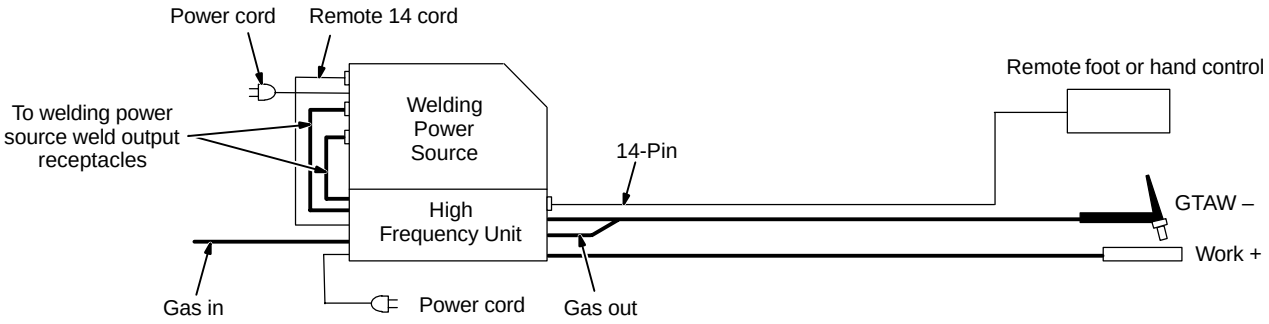


Minutes

OR
Reduce Duty Cycle

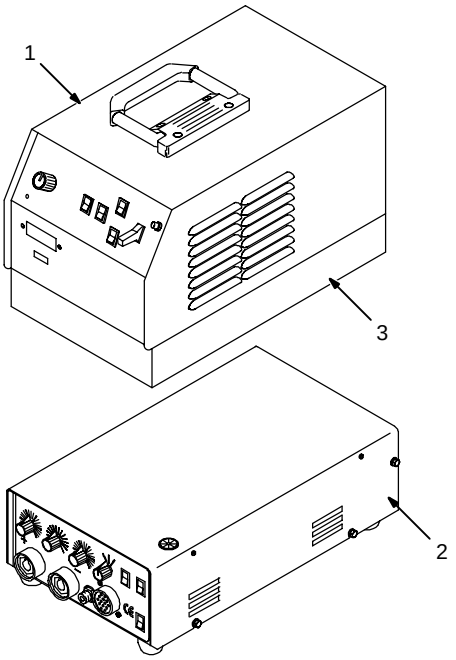
duty1 4/95 / Ref. SA-168 919

3-3. Typical Process Connections



3-4. Installing Mounting Brackets (Optional)

NOTE *The supplied mounting brackets allow the high-frequency unit to be mounted under a Maxstar welding power source. If connecting to the Maxstar for input power, make input power connections according to Section 3-9B before installing mounting brackets.*



1 Maxstar Welding Power Source

Position on top of high-frequency unit.

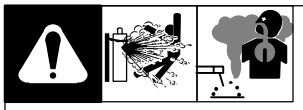
2 High-Frequency Unit

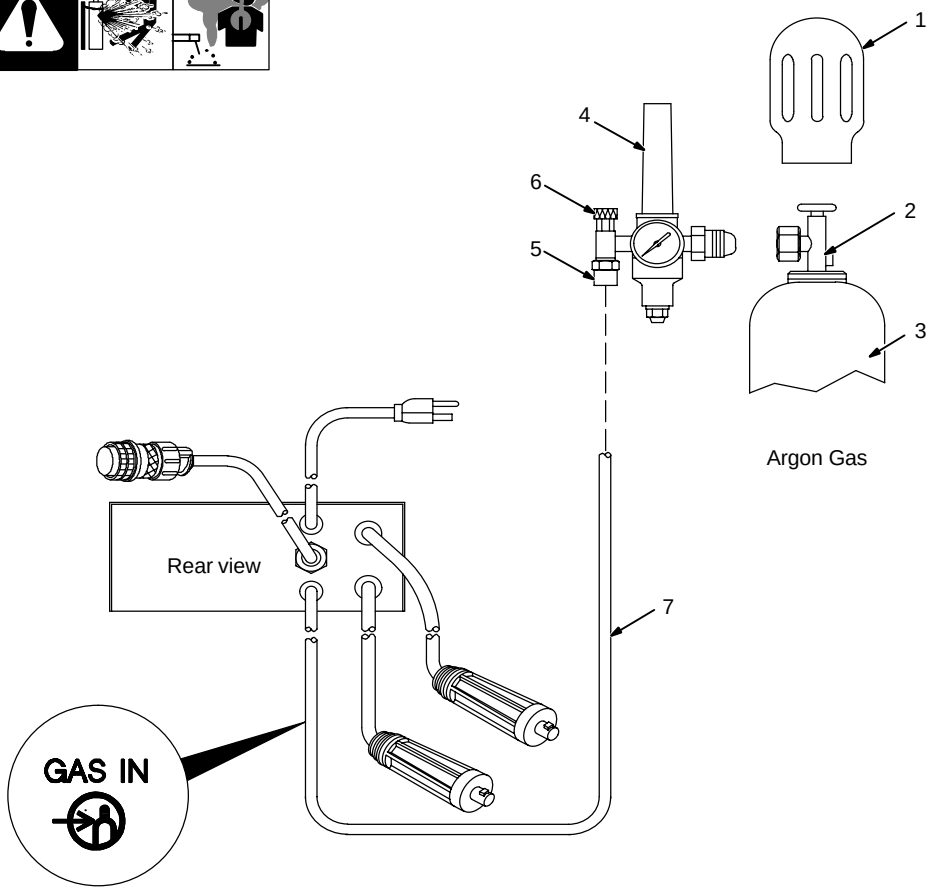
3 Notched Mounting Bracket

Position notched bracket on right side of units so holes align and install screws.

Position remaining bracket on left side of units and install with remaining screws.

3-5. Installing Gas Supply





Obtain gas cylinder and chain to running gear, wall, or other stationary support so cylinder cannot fall and break off valve.

1 Cap

2 Cylinder Valve

Remove cap, stand to side of valve, and open valve slightly. Gas flow blows dust and dirt from valve. Close valve.

3 Cylinder

4 Regulator/Flowmeter

Install so face is vertical.

5 Gas Hose Connection

6 Flow Adjust

Typical flow rate is 15 cfh (cubic feet per hour).

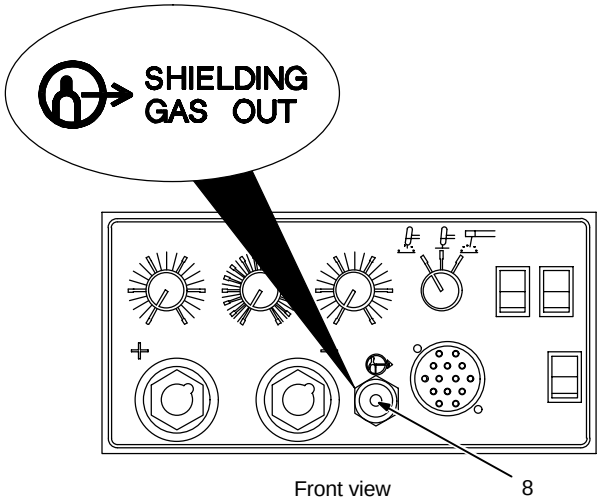
Make sure flow adjust is closed when opening cylinder to avoid damage to the flowmeter.

7 Gas Input Line

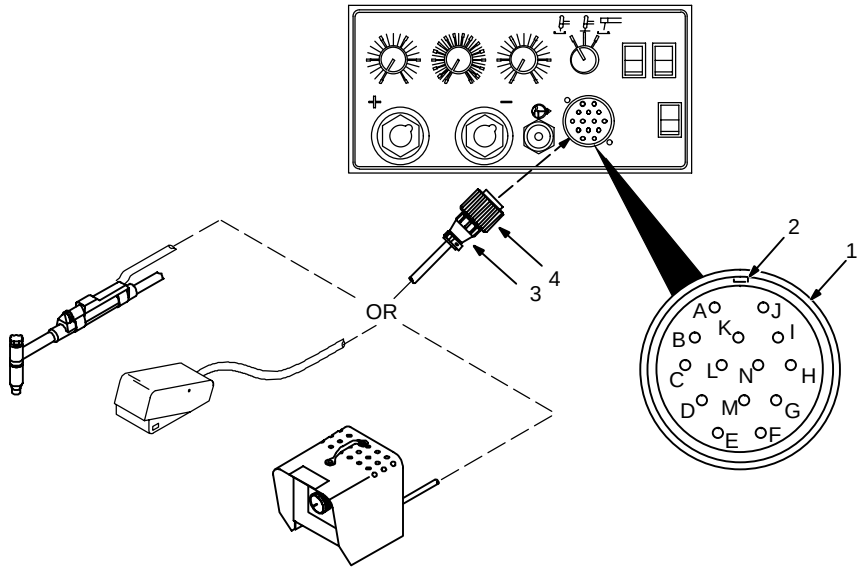
8 Gas Out Fitting

Connect hose from shielding gas supply regulator/flowmeter to Gas In fitting.

Connect shielding gas hose from torch to Gas Out fitting.



3-6. Remote 14 Receptacle Information and Connections



1 Remote 14 Receptacle RC

2 Keyway

3 Plug

4 Threaded Collar

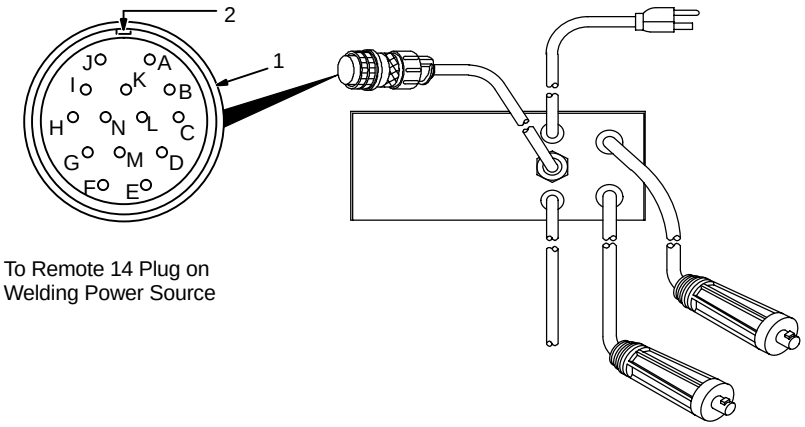
To connect to receptacle, align keyway, insert plug, and tighten threaded collar.

sb7.1 5/94 – ST-800 293 / Ref. S-0004-A / S-0750

REMOTE 14	Socket*	Socket Information
OUTPUT (CONTACTOR)	A	24 volts ac.
	B	Contact closure to A completes 24 volts ac contactor control circuit.
A AMPERAGE	C	+10 volts dc output to remote control.
	D	Remote control circuit common.
	E	0 to +10 volts dc input command signal from remote control.

*The remaining sockets are not used.

3-7. Remote 14 Plug Information and Connections



1 Remote 14 Plug PLG3

2 Keyway

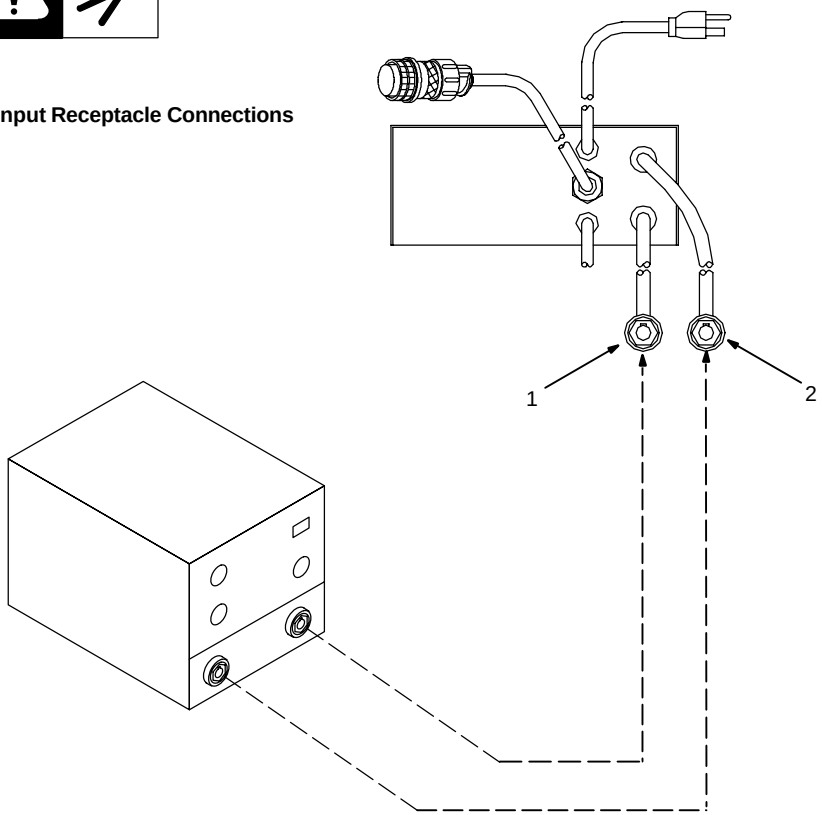
To connect plug to a Remote 14 receptacle on the welding power source, align keyway, insert plug, and tighten threaded collar.

REMOTE 14	Socket*	Socket Information
OUTPUT (CONTACTOR)	A	+15 volts dc input from welding power source.
	B	Contact closure to A completes +15 volts dc contactor control circuit.
A AMPERAGE	D	Remote control circuit common.
	E	0 to +10 volts dc command signal from remote control to welding power source.

*The remaining sockets are not used.

3-8. Connecting to Weld Input and Output Receptacles

Input Receptacle Connections



1 Negative (–) Input Plug

Connect negative (–) input plug to negative (–) weld output receptacle on welding power source.

2 Positive (+) Input Plug (Red Mark)

Connect positive (+) input plug to positive (+) weld output receptacle on welding power source.

GTAW DC Electrode Negative/ Straight Polarity (DCEN)

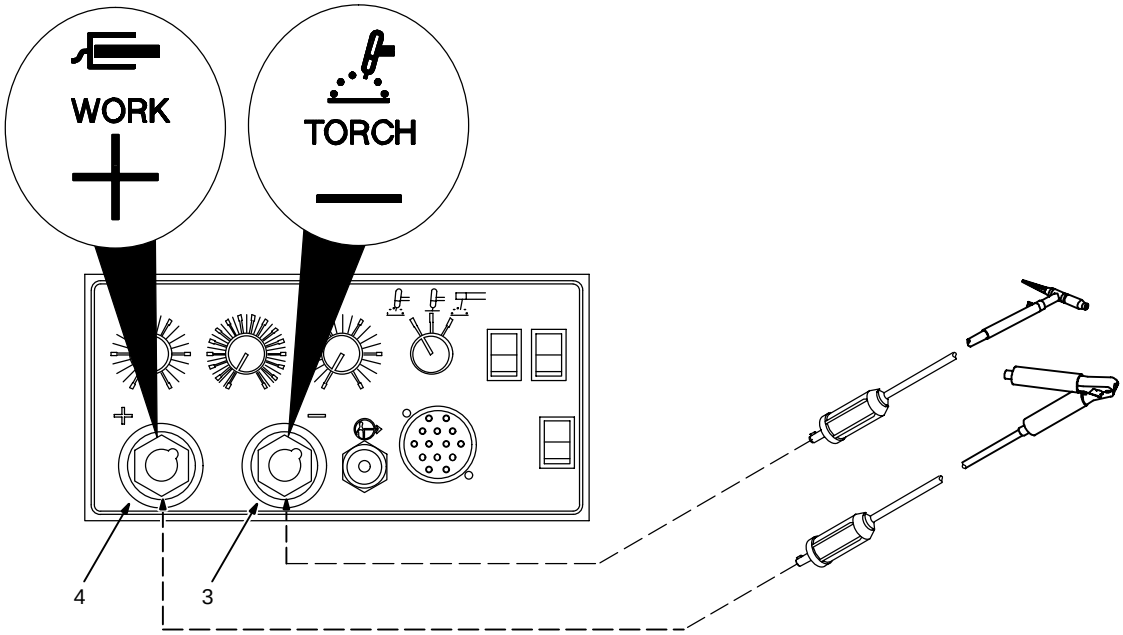
3 Torch (–) Receptacle

Connect torch cable.

4 Work (+) Receptacle

Connect one end of work cable, connect remaining end to work-piece.

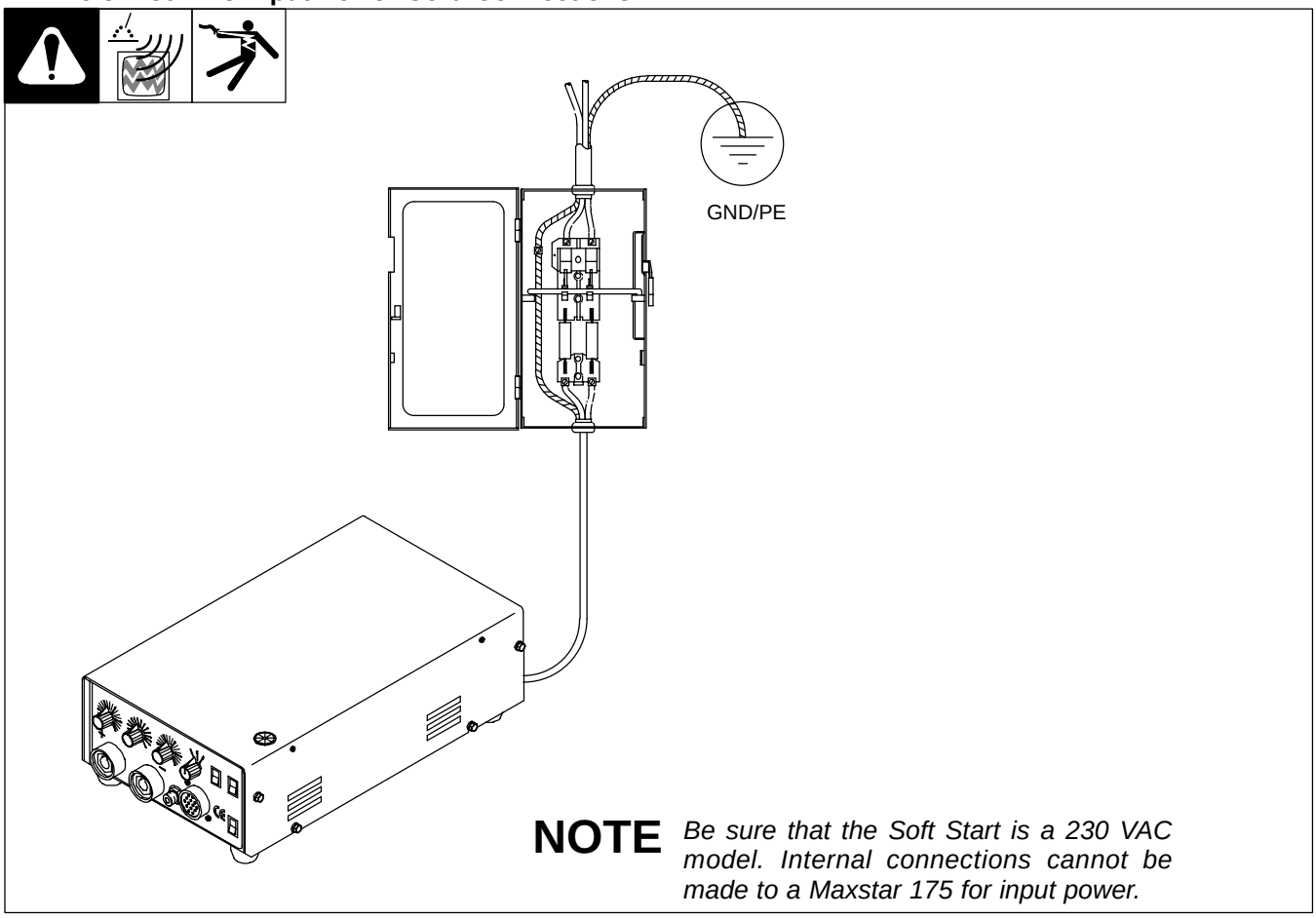
Output Receptacle Connections



S-0841 / SA-132 499-A / ST-800 293 / Ref. SC-158 511

3-9. Connecting Input Power

A. 115 or 230 VAC Input Power Cord Connections

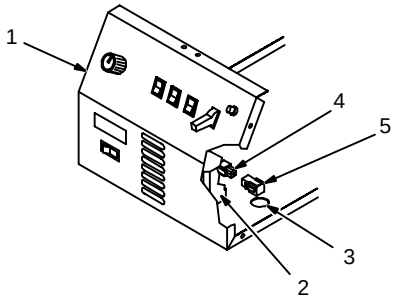


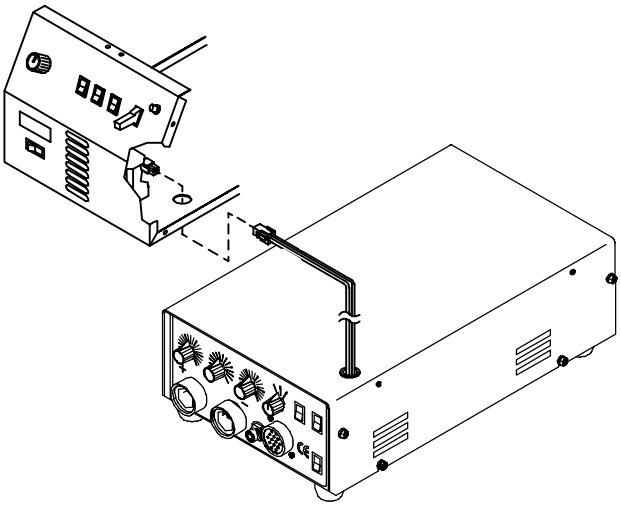
NOTE *Be sure that the Soft Start is a 230 VAC model. Internal connections cannot be made to a Maxstar 175 for input power.*

B. Power Connections to a Maxstar 91 or 152 Welding Power Source

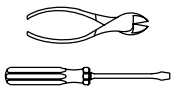
NOTE *Be sure that the Soft Start is a 230 VAC model. Internal connections cannot be made to a Maxstar 175 for input power.*

Parts needed for this procedure are supplied with the high-frequency unit.





Tools Needed:



1 Welding Power Source

Remove wrapper.

2 Snap-In Blank

Remove blank and install supplied bushing into hole.

3 Control Relay CR1

4 Plug PLG11

PLG11 is secured in a lead bundle near control relay CR1. It may be necessary to remove cable tie to access PLG11.

5 Protective Blank

Remove blank from PLG11.

Position welding power source above high-frequency unit, and route RC11 through bushing in welding power source case bottom.

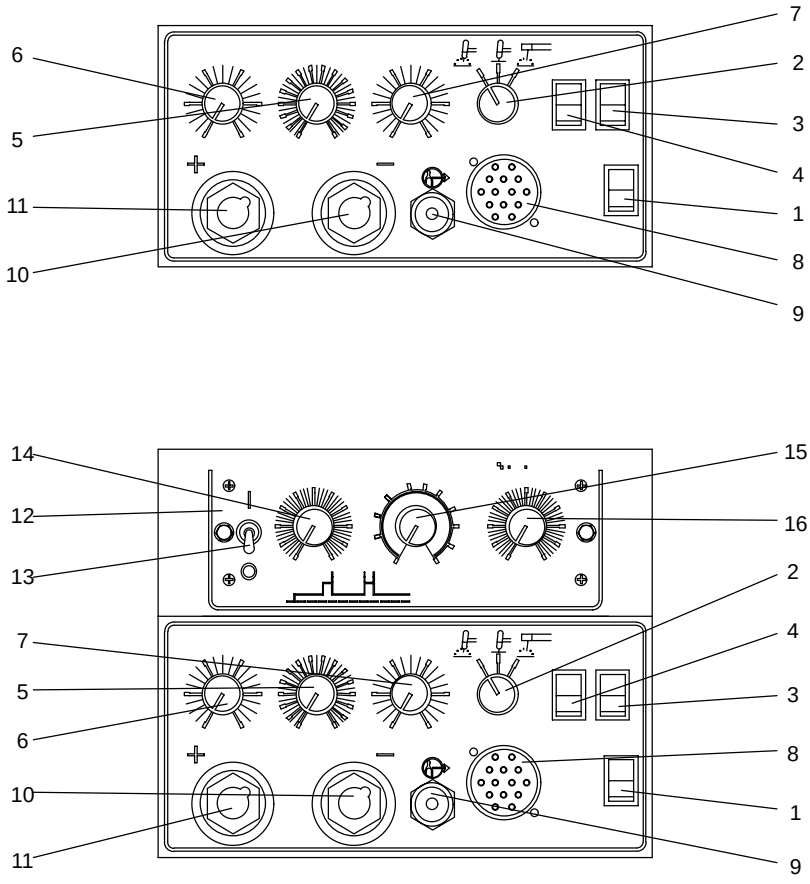
Connect plug PLG11 to receptacle RC11. Use cable ties to secure leads to lead bundle in welding power source so leads are away from fan blade.

Reinstall welding power source wrapper.

Install mounting brackets according to Section 3-4.

SECTION 4 – OPERATION

4-1. Controls



1 Power ON Switch

2 Process Selector Switch

GTAW welding (DC) with high frequency arc starting

GTAW welding (DC) with lift arc starting

SMAW

3 Amperage Control Panel or Remote

4 Trigger Operation Switch

Impulse - torch trigger is closed, arc starts, the trigger released and the weld progresses. The trigger is then press and the arc is extinguished.

Continuous - torch trigger must be maintained during the weld process.

5 Amperage Control

6 Upslope Time - 0-15 seconds

7 Downslope Time - 0-15 seconds

8 Remote Control Receptacle

9 Gas Outlet

10 Negative (–) Output Terminal

11 Positive (+) Output Terminal

12 Optional Pulser Module

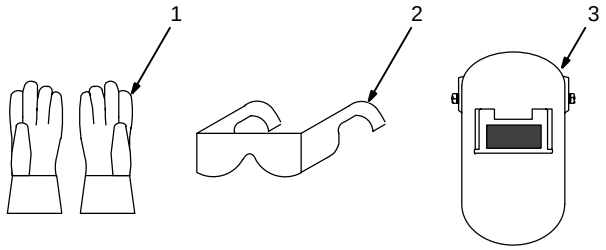
13 Pulser On/Off Switch

14 Background Current Adjustment

15 Pulser Frequency 5-20 Hz or 10-300 Hz. Define by switch mark 10 and 300 located on the pulser printed circuit board.

16 % on Time

4-2. Safety Equipment



Wear the following while welding:

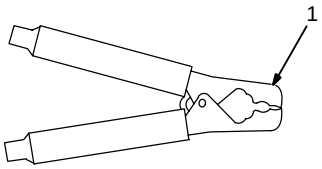
1 Dry, Insulating Gloves

2 Safety Glasses with Side Shields

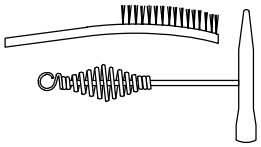
3 Welding Helmet with Correct Shade of Filter (See ANSI Z49.1)

sb3.1 1/94

4-3. Work Clamp



Tools Needed:



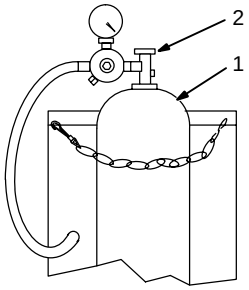
1 Work Clamp

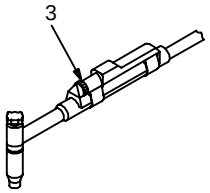
Connect work clamp to a clean, paint-free location on workpiece, as close to weld area as possible.

Use wire brush or sandpaper to clean metal at weld joint area. Use chipping hammer to remove slag after welding.

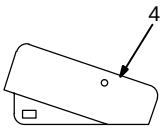
sb4.1 2/93

4-4. Shielding Gas





OR



1 Shielding Gas Cylinder

2 Valve

3 Torch Output Control

4 Foot Control

Open valve on cylinder just before welding.

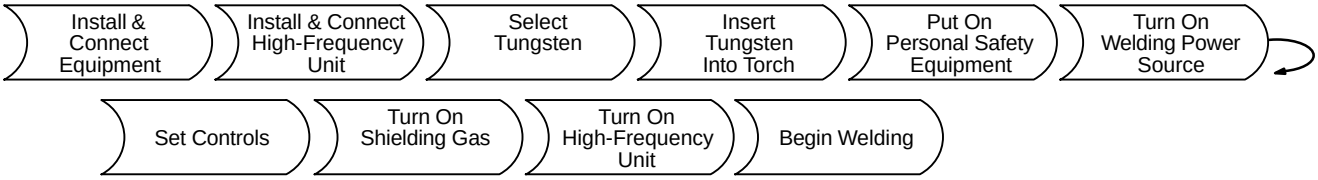
Torch output control or foot control turns weld output and gas flow on and off.

The postflow timne is preset for 10 seconds. See circuit diagram fo rthe location of an adjustment potiemeter on PC1.

Close valve on cylinder when finished welding.

sb5.2* 5/94 – S-0621-C / S-0769

4-5. Sequence of Gas Tungsten Arc Welding (GTAW)



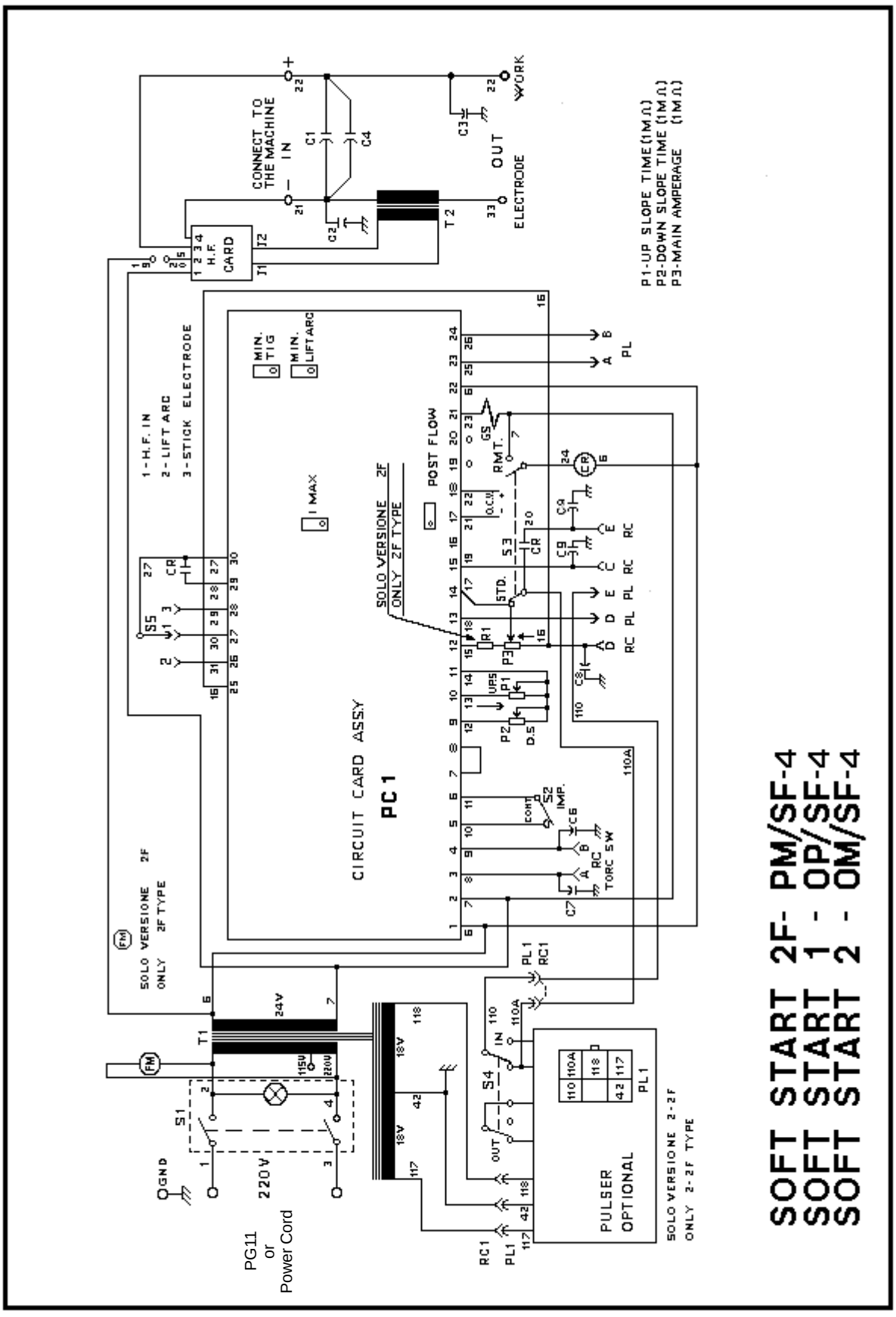
ssb8.1 12/92

SECTION 5 – MAINTENANCE & TROUBLESHOOTING

5-1. Troubleshooting

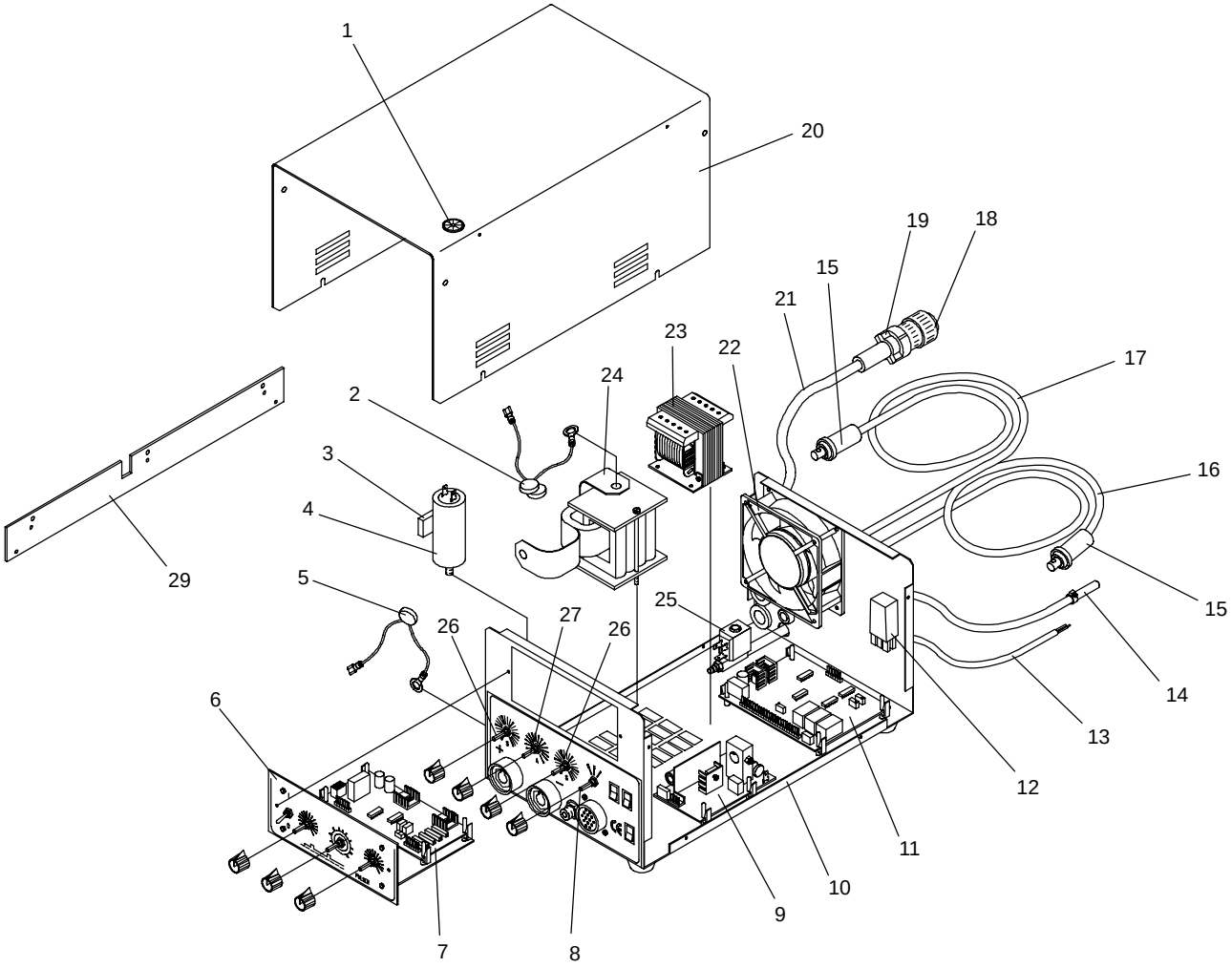
Problem	Probable Cause	Remedy
Lack of HF, difficult arc starting. Starting current unstable.	Leakage of HF through TIG torch cables.	Prevent torch cables from contacting work circuit.
	Torch or work cables broken or damaged.	Repair or replace damaged parts.
	Torch and work cable coiled or excessively long.	Uncoil cables or reduce length.
	Tungsten electrode diameter too large or wrong type for amperage selected.	Use correct size or type of tungsten electrode.
	High frequency printed circuit or PC1 is faulty.	Replace or contact authorized distributor.
Difficulty in the control of arc or stability.	Diameter or type of tungsten electrode incorrect.	Use correct tungsten electrode.
	Worn or faulty remote controls.	Check for loose connections and worn parts.
Tungsten electrode oxidizing and not staying clean after completion of weld.	Contact with filler wire or workpiece while welding.	Prevent contact with either.
	Poor gas connection causing contamination of shielding gas supply.	Check all gas fittings for loose connections.
	Insufficient shielding gas flow.	Increase gas flow rates.

SECTION 6 – ELECTRICAL DIAGRAMS



SECTION 7 – PARTS LIST

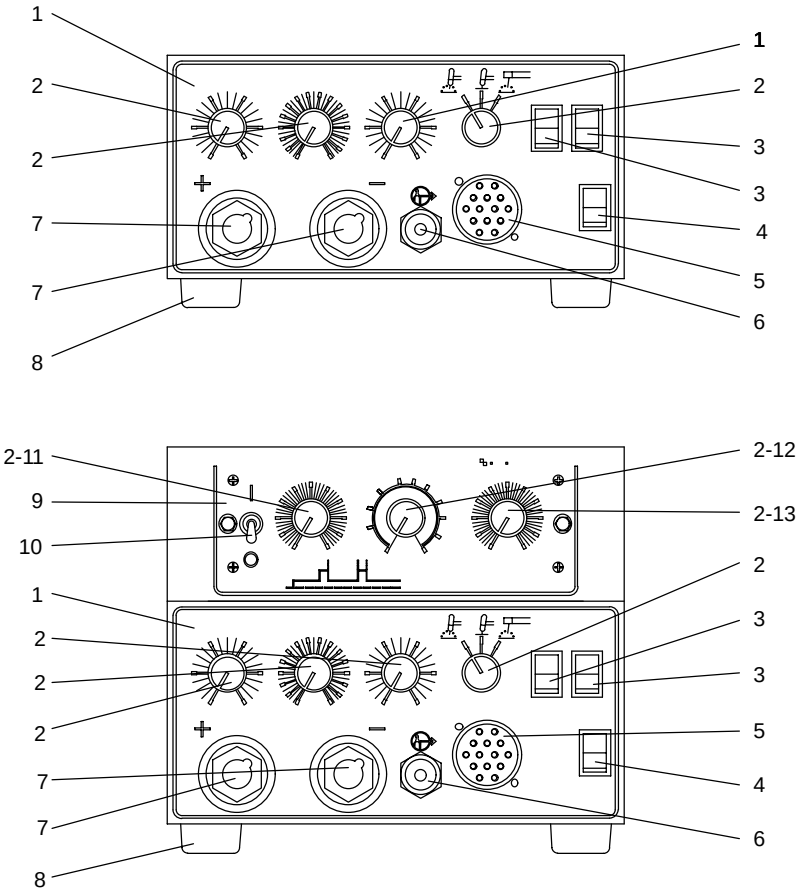
7-1. Main Assembly for Soft Start 1, 2, and 2F



Item	Dia Ref.	Code	Dwg	Qty. mod 1	Qty. mod 2	Qty. mod 2F
1		656089022	OM.0.0.17	1	1	1
2	C2	027024078	OP.0.1	1	1	1
3	C4	027024068	NB.0.11	1	1	1
4	C1	056082016	DZ.7.0.5	1	1	1
5	C3	027024072	OM.0.7	1	1	1
6	(Optional)	316029583	MG.11.0.3		1	1
7	(Optional)	057084030	MG.11.1		1	1
8	S5	056067170	OM.0.0.7	1	1	1
9	HF P.C.B.	057084072	OP.0.3	1	1	1
10		116006097	OM.0.0.13		1	1
10		116006099	OP.0.0.4	1		
11	P.C.B.	028061036	OM.1	1	1	1
12	CR	056057104	DV.11.0.4	1	1	1
13	(V.220)	057094018	OM.0.5	1	1	
13	(V.115)	057014046	OM.0.6	1	1	
13	(V.220)	057014046	OM.0.6			1
14	(Mt. 3,200)	650020117		1	1	1
15		056076151	DD.0.0.6	2	2	2

Item	Dia Ref.	Code	Dwg	Qty. mod 1	Qty. mod 2	Qty. mod 2F
16	Cable (+)	027112017	OM.0.2	1	1	
16	Cable (+)	027112029	OM.0.8			1
17	Cable (–)	027112018	OM.0.3	1	1	
17	Cable (–)	027112030	OM.0.9			1
18	PL	056076172	CZ.0.5.1	1	1	1
19		056091037	CZ.0.5.3	1	1	1
20		116121077	OP.0.0.5	1		
20		116121072	OM.0.0.2		1	1
21		027112019	OM.0.1	1	1	
21		027112031	OM.0.10			1
22	FM 220 V	056126062	UR.0.0.7			1
23	T1	058021031	EE.1	1	1	1
24	T2	056077044	OM.0.0.15	1	1	1
25	GS (24VAC)	056061042	UV.0.0.7	1	1	1
26	P1-P2	056059191	DH.8.0.3	2	2	2
27	P3	056059182	DC.0.0.9	1	1	1
28	R1	056059248	PM.0.0.3			1
29		116122220	OM.0.0.4	2	2	2

7-2. Control Panel for Soft Start 1, 2, and 2F



Item	Dia Ref.	Code	Dwg	Qty. mod 1	Qty. mod 2	Qty. mod 2F
1		316029604	PM.0.0.2			1
1		956142083	OM.0.0.18	1	1	
2		000097922	BP.2.0.20	4	4	4
2	(Knob, Pulser)	000097922	BP.2.0.20		3	3
3	S2-S3	056067169	OM.0.0.6	2	2	2
4	S1	056067168	OM.0.0.5	1	1	1
5	RC	057084050	OM.0.12	1	1	1
6		556049150	DZ.11.0.3	1	1	1

Item	Dia Ref.	Code	Dwg	Qty. mod 1	Qty. mod 2	Qty. mod 2F
7	(50mmq)	056076152	DD.0.0.7	2	2	2
8		656110001	EL.0.0.2	4	4	4
9	Pulser (Opt.)	058066006			1	1
10	S4 (Pulser)	056067021	DZ.12.0.7		1	1
11	(Pot. Back Gr.)	056059182	DC.0.0.9		1	1
12	(Pot. Pulses/Sec.)	056059213	EE.2.0.1		1	1
13	(Pot. % On Time)	056059214	EE.2.0.2		1	1

TRUE BLUE® WARRANTY

Effective January 1, 1999

This limited warranty supersedes all previous Miller warranties and is exclusive with no other guarantees or warranties expressed or implied.

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1. 5 Years Parts – 3 Years Labor
   * Original main power rectifiers
   * Inverters (input and output rectifiers only)
2. 3 Years — Parts and Labor
   * Transformer/Rectifier Power Sources
   * Plasma Arc Cutting Power Sources
   * Semi-Automatic and Automatic Wire Feeders
   * Inverter Power Supplies
   * Intellitig
   * Engine Driven Welding Generators **(NOTE: Engines are warranted separately by the engine manufacturer.)**
3. 1 Year — Parts and Labor
   * Motor Driven Guns (w/exception of Spoolmate 185)
   * Process Controllers
   * Positioners and Controllers
   * Automatic Motion Devices
   * Robots
   * RFCS Foot Controls
   * IHPS Power Sources
   * Water Coolant Systems
   * HF Units
   * Grids
   * Spot Welders
   * Load Banks
   * SDX Transformers
   * Miller Cyclomatic Equipment
   * Running Gear/Trailers
   * Plasma Cutting Torches (except APT, ZIPCUT & PLAZCUT Models)
   * Field Options (NOTE: Field options are covered under True Blue® for the remaining warranty period of the product they are installed in, or for a minimum of one year — whichever is greater.)
4. 6 Months — Batteries
5. 90 Days — Parts and Labor
   * MIG Guns/TIG Torches
   * APT, ZIPCUT & PLAZCUT Model Plasma Cutting Torches
   * Remote Controls
   * Accessory Kits
   * Replacement Parts (No labor)
   * Spoolmate 185

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2. Consumable components; such as contact tips, cutting nozzles, contactors, brushes, slip rings, relays or parts that fail due to normal wear.
3. Equipment that has been modified by any party other than Miller, or equipment that has been improperly installed, improperly operated or misused based upon industry standards, or equipment which has not had reasonable and necessary maintenance, or equipment which has been used for operation outside of the specifications for the equipment.

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Please complete and retain with your personal records.

Model Name Serial/Style Number

Purchase Date (Date which equipment was delivered to original customer.)

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